in the same fashion. Only one collection of characters is displayed and scrolled through at any time, and the user has to successively display other collections of characters, e.g. numerals, symbols or punctuation marks until a desired set is displayed. A similar approach is described in the '117 patent. Again, this operating mode is inherently slow and not user friendly.

[0011] In the '115 patent, the letters of the alphabet and a space in a character spin dial are scrolled by the user manipulating up-down keys to successively display characters in each character position or cell of characters that make up a word that is entered in a text display region of the display. Presumably other characters and punctuation marks and the like can be selected and scrolled through. Again, the process is slow and suited to very limited text entry.

[0012] Thus, up to now, user specification of a desired character from a collection of characters has been shown to be accomplishable in one of two fundamental ways. In the first way, there are as many selection keys as there are unique characters. When the user presses a selection key, the character identified with that key is entered. In the second way, there is a display window and a single selection key. When the user presses the selection key, the character being displayed in the display window at the time that the selection key is pressed, is entered.

[0013] From this, it can be concluded that there are two variables that can be used to specify a character. In the first method, it is position. In the second method, it is time. Up to now, these methods have been used independently, and using position to distinguish characters has been, by far, the most popular, as exemplified by the popularity of the QWERTY keyboard. However, for miniature devices there remains an unmet need for improvements in data entry that is sufficiently compact to fit onto the face of the device while at the same time not severely compromising the speed, accuracy, and user convenience of inputting data to the device.

[0014] In the invention described here, the two separate methods of specifying a character (position and time) are recognized, and then used together to form a multiplexed method of specifying a character.

[0015] In the character specification methods described above, all the characters either had their own selection key, or their own selection time in the display window. In this new method and associated apparatus, few or no characters have their own selection key, and no character ever has its own display time. In this method, both the selection key pressed and the time that it is pressed determine the character desired for specification.

[0016] To accomplish this, a special organization of the characters in the alphabet is made. The optimum organization requires knowledge of the number of unique characters in the overall collection of characters (x), the number of selection keys desired (z), and the number of character groups that is convenient and acceptable (y).

[0017] In this organization, the entire collection of characters is first divided up into character groups. A character group is a subset of characters from the total collection of characters. The collection of characters is divided up so that every character falls into a group, and so that there are approximately the same number of characters in each group.

[0018] To take advantage of this organization, a keyboard having both a display window and selection keys is used. Optimally, the display window holds as many characters as there are in a single character group, and there are at least as many selection keys as the display window holds characters. As stated above, both the selection key pressed, and the time that it is pressed, will be used to determine the character desired for specification.

[0019] To do this, characters are presented to the user in the display window in groups. To specify a character from the displayed group, the selection key associated with that character's position in the display window is pressed. If the character desired for selection is not displayed, the character group is changed to the group containing the desired character. Then, at the time that the character group containing the desired character is displayed, the desired character is specified by pressing the selection key associated with that character's position in the display window. Repeating this in time sequence, characters can be selected to build the text or data string desired for entry.

[0020] It will be appreciated that the invention is implemented in software routines or applications that may allow for customization by the user to define the number of display windows or corresponding character groups, the characters in each character group, the hardware or displayed keys to be employed in selecting characters in the display window, as well as user definable keys. The user can then load the software and the custom settings into any compatible device, whereby the user enjoys the benefits of a personalized and portable keyboard. In order to facilitate such portability from device to device, keyboard configurations could be downloadable to any compatible system to facilitate character entry. This would permit users who have become accustomed to their own keyboard on their portable devices or desktop computer to use that same keyboard on other devices that they use. Such users could physically or virtually carry an electronic copy of "their" keyboard with them, for example, as part of a user's profile associated with a device. Their "virtual" keyboard could be downloaded through an Internet or intranet connection into whatever device that they want to use.

[0021] The usefulness of the invention described herein is that it offers a method for entering data into a portable or miniature electronic device, one too compact for a conventional keyboard, without severely compromising data entry speed, accuracy, and convenience.

[0022] In accordance with the present invention, there is provided a method of character data entry through a user's sequential selection of characters, from a collection of characters, depicted on a display, comprising: defining a plurality of character groups from the collection of characters, wherein the number of character groups is less than the number of characters in the collection of characters; providing a display window within a screen to display at least one of said character groups in the display window; displaying the characters of one of the plurality of character groups in the display window; providing means to change the character group displayed in the display window from one group to another; detecting the selection by the user of one of the characters displayed in the display window; and entering the user selected character.

[0023] In accordance with another aspect of the present invention, there is provided a method of character entry